

Jackie Lay

The Toxins That Threaten Our Brains

Leading scientists recently identified a dozen chemicals as being responsible for widespread behavioral and cognitive problems. But the scope of the chemical dangers in our environment is likely even greater. Why children and the poor are most susceptible to neurotoxic exposure that may be costing the U.S. billions of dollars and immeasurable peace of mind.

By James Hamblin
MARCH 18, 2014

Forty-one million IQ points. That’s what Dr. David Bellinger determined Americans have collectively forfeited as a result of exposure to lead, mercury, and organophosphate pesticides. In a 2012 [paper](#) published by the National Institutes of Health, Bellinger, a professor of neurology at Harvard Medical School, compared intelligence quotients among children whose mothers had been exposed to these neurotoxins while pregnant to those who had not. Bellinger calculates a total loss of 16.9 million IQ points due to exposure to organophosphates, the most common pesticides used in agriculture.

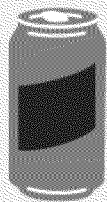
Last month, more research brought concerns about chemical exposure and brain health to a heightened pitch. Philippe Grandjean, Bellinger’s Harvard colleague,

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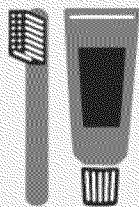


and Philip Landrigan, dean for global health at Mount Sinai School of Medicine in Manhattan, announced to some controversy in the pages of a prestigious medical journal that a “silent pandemic” of toxins has been damaging the brains of unborn children. The experts named 12 chemicals—substances found in both the environment and everyday items like furniture and clothing—that they believed to be causing not just lower IQs but ADHD and autism spectrum disorder. Pesticides were among the toxins they identified.

MEET THE NEUROTOXINS



Manganese



Fluoride



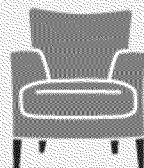
Chlorpyrifos



DDT/DDE



Tetrachloroethylene (PERC)



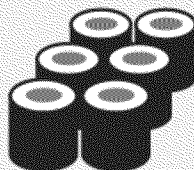
Polybrominated Diphenyl Ethers (PBDEs)



Arsenic



Lead



Mercury



Toluene



Ethanol



Polychlorinated Biphenyls (PCBs)

Jackie Lay

“So you recommend that pregnant women eat organic produce?” I asked Grandjean, a Danish-born researcher who travels around the world studying delayed effects of chemical exposure on children.

“That’s what I advise people who ask me, yes. It’s the best way of preventing

exposure to pesticides.” Grandjean estimates that there are about 45 organophosphate pesticides on the market, and “most have the potential to damage a developing nervous system.”

Landrigan had issued that same warning, unprompted, when I spoke to him the week before. “I advise pregnant women to try to eat organic because it reduces their exposure by 80 or 90 percent,” he told me. “These are the chemicals I really worry about in terms of American kids, the organophosphate pesticides like chlorpyrifos.”

For decades, chlorpyrifos, marketed by Dow Chemical beginning in 1965, was the most widely used insect killer in American homes. Then, in 1995, Dow was fined \$732,000 by the EPA for concealing more than 200 reports of poisoning related to chlorpyrifos. It paid the fine and, in 2000, withdrew chlorpyrifos from household products. Today, chlorpyrifos is classified as “very highly toxic” to birds and freshwater fish, and “moderately toxic” to mammals, but it is still used widely in agriculture on food and non-food crops, in greenhouses and plant nurseries, on wood products and golf courses.

These chemicals aren’t something that anyone would categorically consider safe. They are poison.

Landrigan has the credentials of some superhero vigilante Doctor America: a Harvard-educated pediatrician, a decorated retired captain of the U.S. Naval Reserve, and a leading physician-advocate for children’s health as it relates to the environment. After September 11, he made news when he testified before Congress in disagreement with the EPA’s assessment that asbestos particles stirred into clouds of debris were too small to pose any real threat. Landrigan cited research from mining townships (including Asbestos, Quebec) and argued that even the smallest airborne asbestos fibers could penetrate deeply into a child’s lungs.

Chlorpyrifos is just one of 12 toxic chemicals Landrigan and Grandjean say are having grim effects on fetal brain development. Their new study is similar to a review the two researchers published in 2006, in the same journal, identifying six developmental neurotoxins. Only now they describe twice the danger: The number of chemicals that they deemed to be developmental neurotoxins had doubled over the past seven years. Six had become 12. Their sense of urgency now approached panic. “Our very great concern,” Grandjean and Landrigan wrote, “is that children worldwide are being exposed to unrecognized toxic chemicals that are silently eroding intelligence, disrupting behaviors, truncating future achievements and damaging societies.”

The chemicals they called out as developmental neurotoxins in 2006 were methylmercury, polychlorinated biphenyls,



CHLORPYRIFOS

Pesticide currently used on food and non-food crops.

Jackie Lay

ethanol, lead, arsenic, and toluene. The additional chemicals they've since found to be toxins to the developing brains of fetuses—and I hope you'll trust me that these all are indeed

words—are manganese, fluoride, chlorpyrifos, tetrachloroethylene, polybrominated diphenyl ethers, and dichlorodiphenyltrichloroethane.

Grandjean and Landrigan note in their research that rates of diagnosis of autism spectrum disorder and ADHD are increasing, and that neurobehavioral development disorders currently affect 10 to 15 percent of births. They add that “subclinical decrements in brain function”—problems with thinking that aren’t quite a diagnosis in themselves—“are even more common than these neurobehavioral development disorders.”

In perhaps their most salient paragraph, the researchers say that genetic factors account for no more than 30 to 40 percent of all cases of brain development disorders:

Thus, non-genetic, environmental exposures are involved in causation, in some cases probably by interacting with genetically inherited predispositions. Strong evidence exists that industrial chemicals widely disseminated in the environment are important contributors to what we have called the global, silent pandemic of neurodevelopmental toxicity.

Silent pandemic. When public health experts use that phrase—a relative and subjective one, to be deployed with discretion—they mean for it to echo.

When their paper went to press in the journal *The Lancet Neurology*, the media responded with understandable alarm:

“A ‘Silent Pandemic’ of Toxic Chemicals Is Damaging Our Children’s Brains, Experts Claim” - *Minneapolis Post*, 2/17/14

“Researchers Warn of Chemical Impacts on Children,” -*USA Today*, 2/14/14

“Study Finds Toxic Chemicals Linked to Autism, ADHD” - *Sydney Morning Herald*, 2/16/14

When I first saw these headlines, I was skeptical. It wasn’t news that many of the chemicals on this list (arsenic, DDT, lead) are toxic. With each of these substances, the question is just how much exposure does it take to cause real damage. For instance, organophosphates aren’t something that anyone would categorically consider safe, in that they are poison. They kill insects by the same mechanism that sarin gas kills people, causing nerves to fire uncontrollably. But like asbestos, they are still legally used in U.S. commerce, with the idea that small amounts of exposure are safe. The adage “the dose makes the poison” may be the most basic premise of toxicology. And hadn’t we already taken care of lead? Didn’t we already know that alcohol is bad for fetuses? Wasn’t fluoride good for teeth?

RELATED STORY

This Is Your Brain on Gluten

“Dr. David Perlmutter is not joking when he says that carbohydrates, even the whole-grain carbs that many of us think of as the good ones, are the cause of almost every modern neurologic malady. That includes dementia, decreased libido, depression, chronic headaches, anxiety, epilepsy, and ADHD.”

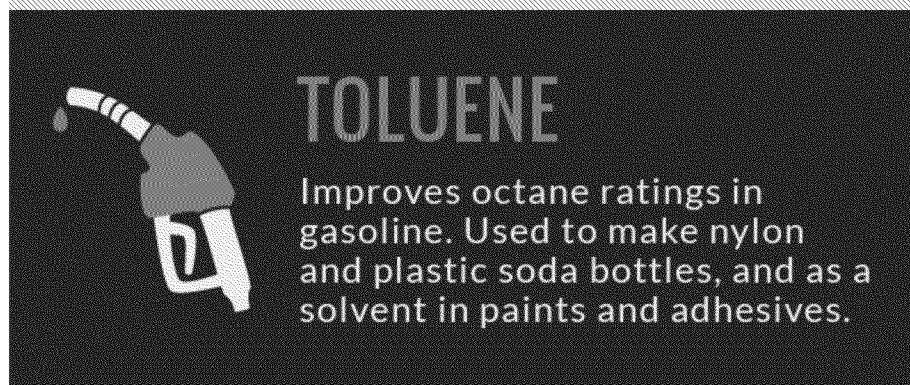
[Read the full December 2013 story](#) by James Hamblin

I found that the real issue was not this particular group of 12 chemicals. Most of them are already being heavily restricted. This dozen is meant to illuminate something bigger: a broken system that allows industrial chemicals to be used without any significant testing for safety. The greater concern lies in what we're exposed to and don't yet know to be toxic. Federal health officials, prominent academics, and even many leaders in the chemical industry agree that the U.S. chemical safety testing system is in dire need of modernization. Yet parties on various sides cannot agree on the specifics of how to change the system, and two bills to modernize testing requirements are languishing in Congress. Landrigan and Grandjean's real message is big, and it involves billion-dollar corporations and Capitol Hill, but it begins and ends with the human brain in its earliest, most vulnerable stages.

How Toxins Destroy Brains

About a quarter of your body's metabolism goes toward operating and maintaining your brain. In order to process even basic information, billions of chemical signals are constantly being carried between neurons. The undertaking is so onerous that even though your brain is not moving (like, say, the powerful muscles in your legs), it uses around 10 times more calories per pound than the rest of you.

Most of that industrious brain and its 86 billion neurons were created in a matter of months. During the first few weeks of gestation, when your mother knew you only as morning sickness and you were a layer of cells huddled in one corner of her uterus, those cells lined up, formed a groove, and then closed to form a tube. One end of that tube eventually became your tiny spinal cord. The rest expanded to form the beginnings of your brain.



Jackie Lay

For a brain to develop properly, neurons must move to precise places in a precise sequence. They do so under the direction of hormones and chemical neurotransmitters like acetylcholine. The process is an intricate, fast-paced dance on a very tiny scale. Each nerve cell is about one hundredth of a millimeter wide, so it has to travel its own width 25,000 times just to move an inch—which some neurons in the cortex must. At any point, that cell can be knocked off course. Some of the neurotoxins Grandjean and Landrigan discuss have the potential to disrupt this journey, in a slight or serious fashion.

By the third trimester, the surface of the brain begins folding itself into wrinkled

peaks and valleys, the gyri and sulci that make a brain look like a brain. Specific areas of that cortex learn to process specific aspects of sensation, movement, and thought, and that starts in the uterus. As Grandjean explains this process in his 2013 book *Only One Chance*, “Usage promotes function and structure, as the connectivity of the brain cells is shaped by responses to environmental stimuli.” That is, the fetal brain starts having experiences that form the basis for learning and memory. The nature-nurture duality begins at conception.

By age two, almost all of the billions of brain cells that you will ever have are in their places. Except in the hippocampus and one or two other tiny regions, the brain does not grow new brain cells throughout your life. When brain cells die, they are gone. So its initial months of formation, when the brain is most vulnerable, are critical. “During these sensitive life stages,” Grandjean and Landrigan write, exposure “can cause permanent brain injury at low levels that would have little or no adverse effect in an adult.”

Federal health officials are aware of this risk. The National Institutes of Health, as Landrigan puts it, “finally woke up in the late 1990s to the fact that children are much more sensitive and vulnerable to chemicals than adults are.” Over the past decade, the federal government has invested substantially more money in looking at just how pregnant women and children have been affected by industrial chemicals. The EPA has awarded millions of dollars in related research grants, and the NIH started funding a network of what it calls Centers for Children’s Environmental Health and Disease Prevention Research. There is one at Mount Sinai and another at Harvard (the respective homes of Landrigan and Grandjean), and there are others at Columbia, UC Berkeley, and elsewhere.

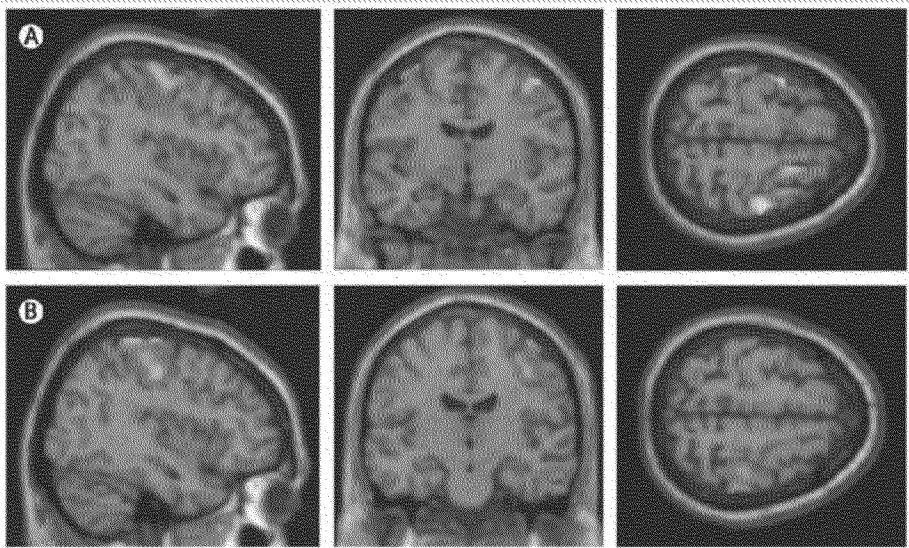
Those centers have established strong research programs called prospective birth-cohort studies. Scientists enroll pregnant female subjects and carefully record objective measures of environmental exposure, using things like blood samples, urine samples, and maybe even dust and air samples from their homes. After the babies are born, the researchers follow up with them at various points in their childhoods. These studies are expensive and take a long time, but they’re incomparably good at connecting prenatal exposures with lost IQ points, shortened attention span, or emergence of ADHD.

RELATED STORY

The Sunshine State’s Pesticide Problem

“The Farmworker Association of Florida found that 92 percent of the agricultural workers in the region had been exposed to pesticides. In a state where the average incidence of birth defects is 3 percent, 13 percent of the Apopka workers had a child born with a defect.”

[Read the full June 2011 story](#) by Barry Estabrook



Functional MRI reveals the effect of prenatal methylmercury exposure in three adolescents. Subjects were asked to tap the fingers of their left hands. In the control group (row B), only the right side of the brain was activated. In the subjects who had been exposed to methylmercury (row A), an abnormal activation pattern shows that both sides are involved. (*The Lancet Neurology*)

“That’s the big breakthrough,” Landrigan says. “The scientific community has mastered the technique of doing these studies, and they’ve been running long enough that they’re beginning to put out some spectacularly good results.” At Columbia, for instance, the children’s center is investigating whether children exposed in the womb to BPA and polycyclic aromatic hydrocarbons (PAHs)—byproducts from burning fossil fuels—are more likely to develop learning and behavior disorders than children not exposed. They have also shown that high prenatal exposure to air pollutants like PAHs are associated with attention problems, anxiety, and depression at ages 5 to 7 years. It was this center, together with the UC Berkeley and Mount Sinai children’s centers, that first identified the detrimental impact of chlorpyrifos on IQ and brain development. The researchers even used MRI testing to show that these chemicals appear to change children’s brain structure, causing thinning of the cortex. Other children’s centers are looking at the extent to which these and other chemicals—including arsenic from well water, brominated flame retardants, and the anti-corrosion agent manganese—are to blame for a range of possible neurologic disorders.

Impressive as all this research investment is, the larger question remains: Why are we looking at these hazards now—instead of before we introduced these chemicals into the world?

The Insidious Rise of Lead

The problem with toxic substances is that their effects can be insidious. Take the example of lead—a chemical that lingered in gasoline, house paints, and children’s toys for decades before scientists realized the true extent of the damage.

Several years ago, a four-year-old boy in Oregon began complaining of stomach pain and vomiting. Doctors reassured his parents that it was likely a viral illness, but his symptoms worsened, and he became completely unable to eat. He also had a badly swollen cheek. The doctors determined that the boy had bitten himself, so

RELATED STORY
Did Michelangelo Suffer From Lead Poisoning?

severely that it must have been during a seizure. Blood tests showed that he was anemic, and subsequent tests found that he had extremely high levels of lead (123 micrograms per deciliter of blood).

The doctors began treating the boy with medication to help clear the lead. They also set out to find out where the lead was coming from. An investigation of the boy's home, which was built in the 1990s, found no lead paint. Despite treatment, though, the boy's lead tests remained abnormally high. So the doctors did an x-ray.

Inside the boy's stomach was a one-inch metal medallion, which appeared bright white on the x-ray image. His parents recognized it as a toy necklace they had purchased from a vending machine approximately three weeks earlier. The state environmental quality lab later found that the medallion contained 38.8 percent lead. The manufacturer later did a voluntary recall of 1.4 million of the metal toy necklaces.

"Though typesetters, tinkers, and drinkers of lead-poisoned wine fell victim to saturnism, the disease was perhaps most widespread among those who worked with paint."

[Read the full November 2013 story](#) by Olga Khazan



A late 19th-century advertisement for lead paint (Boston Public Library)

By that time, manufacturers had been using the toxic substance for centuries, despite clearly dangerous effects. In 1786, Benjamin Franklin wrote to a friend about the first time he heard of lead poisoning. When he was a boy, he recounted, there had been "a complaint from North Carolina against New England Rum, that it poisoned their people, giving them the dry bellyache, with a loss of the use of their limbs. The distilleries being examined on the occasion, it was found that several of them used leaden still-heads and worms, and the physicians were of the opinion that the mischief was occasioned by that use of lead." Franklin went on to describe his observations of similar symptoms in patients at a Paris hospital. When he inquired about their occupations, he discovered that these men were plumbers, glaziers, and painters.

In 1921, General Motors began adding tetraethyl lead to gasoline. Lead gave gasoline a higher octane rating, which meant it could handle more compression without combusting. In practical terms, that meant more powerful engines, faster warplanes, and better industrial transport. The Ethyl Corporation that produced leaded gasoline was a joint venture between GM, Standard Oil, and DuPont. One of its executives, Frank Howard, called leaded gasoline "an apparent gift of God," even

as the plant where tetraethyl lead was synthesized became known as “the Houses of Butterflies,” because it was not uncommon for workers to experience hallucinations of insects on their skin.

Americans in the 1950s and '60s were still widely exposed to unregulated leaded gasoline and paint, as well as piping, batteries, cosmetics, ceramics, and glass. Around that time, studies began to reveal the widespread existence of “subclinical” lead poisoning—damage that was not severe enough to meet diagnostic criteria for a neurologic disease, but would prevent the child from ever achieving optimal intellectual functioning. By 1969, microbiologist and Pulitzer-Prize-winning writer René Dubos said that the problem of lead exposure was “so well-defined, so neatly packaged, with both causes and cures known, that if we don't eliminate this social crime, our society deserves all the disasters that have been forecast for it.”



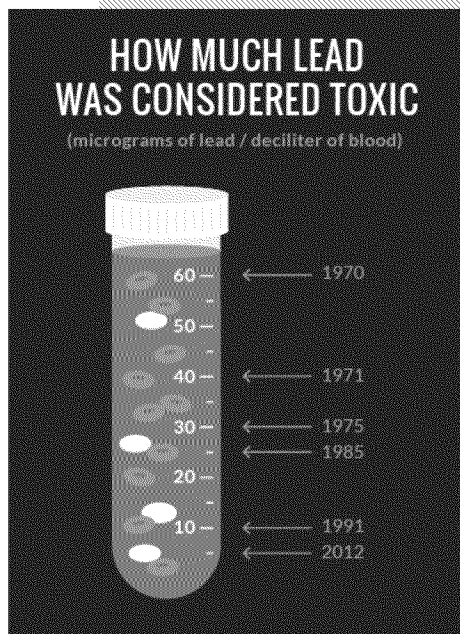
Four-year-old Tanya Brinson is tested for lead paint poisoning at Boston City Hall in June 1975. (Peter Bregg/AP)

By the mid 1970s, the average U.S. preschool child had 15 micrograms of lead per deciliter of blood. Eighty-eight percent of children had a level exceeding 10 $\mu\text{g}/\text{dL}$ —which is twice what the CDC currently considers toxic. Among poor black children, the average level was markedly higher: 23 $\mu\text{g}/\text{dL}$.

Instead of making sweeping policy changes, experts largely accused low-income parents—especially mothers—of inadequate supervision and fostering pathological behaviors that led children to eat paint. With parental ineptitude to blame, and poor, minority children bearing the brunt of the problem, a systematic approach to eliminating lead was a low national priority. Bellinger recounted this in the *Journal of Clinical Investigation*, writing that children were essentially sentinels, used to identify the presence of lead hazards. “As long as the ranks of the lead poisoned consisted primarily of the children of politically and economically disenfranchised parents,” he wrote, “it was hard to interest politicians in the problem. Little political capital could be accumulated by tackling the problem.”

Finally in 1975, the EPA required a gradual phasing of lead out of gasoline. Two

years later, the Consumer Product Safety Commission said that residential paint could contain no more than 0.06 percent lead.



Jackie Lay, adapted from Bellinger, *Journal of Clinical Investigation*

Meanwhile there is still disagreement as to what constitutes a safe level of lead exposure—and if there even is such a thing. As more and more evidence came out over the years showing that low levels are in fact toxic to developing brains, the CDC incrementally lowered that threshold—from 60 micrograms per deciliter of blood in 1970 to 40 in 1971, 30 in 1975, 25 in 1985, 10 in 1991, and finally to just five in 2012.

By 2009 the average lead concentration in the blood Americans was about 1.2 µg/dL for young children—just 8 percent what it was in 1980. But Bellinger notes that even this relatively low level is still “substantially elevated from an evolutionary perspective”—many times higher than before our ancestors

“began to disturb the natural distribution of lead in the earth's crust.”

“Are the blood lead levels of contemporary humans generally below the threshold of toxicity?” Bellinger wrote. “Let us hope so, but the conclusion that they are is based more on faith than on evidence.”

The Toothless Law and the New Test

It's surprising to learn how little evidence there is for the safety of chemicals all around us, in our walls and furniture, in our water and air. Many consumers assume there is a rigorous testing process before a new chemical is allowed to be a part of a consumer product. Or at least some process.

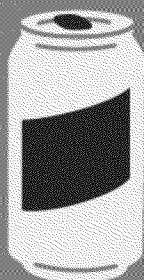
“We still don't have any kind of decent law on the books that requires that chemicals be tested for safety before they come to market,” Landrigan said.

The law we do have is the Toxic Substances Control Act (TSCA, pronounced *toss-ka* among those in the know). Passed in 1976 under President Gerald Ford, it is still today the primary U.S. law regulating chemicals used in everyday products. On its face intended to protect people and the environment from dangerous chemical exposure, it is widely acknowledged to have fallen short of its magnanimous goal. It only requires testing for a small percentage of chemicals, those deemed an “unreasonable risk.”

“It's just an obsolete, toothless, broken piece of legislation,” said Landrigan. “For example, in the early 1990s, EPA was unable to ban asbestos under TSCA.” This was after the National Toxicology Program had classified asbestos as a known cancer-causing agent, and the World Health Organization had called for a global ban. The EPA did briefly succeed in banning asbestos in the U.S. in 1989, but a court of

appeals overturned the ban in 1991. Asbestos is still used in consumer products in the U.S., including building materials like shingles and pipe wrap, and auto parts like brake pads.

Landrigan also calls it “a particularly egregious lapse” that when TSCA was enacted, the 62,000 chemicals already on the market were grandfathered in, such that no toxicity testing was required of them. These chemicals were, as Landrigan puts it, “simply presumed safe” and allowed to remain in commerce until a substantial health concern came to public attention.



MANGANESE

Keeps metal from corroding.
Found in stainless steel and
soda cans.

Jackie Lay

In the nearly 40 years since the law’s passage, more than 20,000 new chemicals have entered the market. “Only five have been removed,” Landrigan says. He notes that the CDC has picked up measurable levels of hundreds of these chemicals in the blood and urine of “virtually all Americans.” Yet, unlike food and drugs, they enter commerce largely untested.

Landrigan and Grandjean’s purpose in declaring a silent pandemic was less about the 12 named substances and more about using them as cautionary tales. They named in their list a few chemicals that still appear to be imminent threats, but they also include some that have been highly restricted in their use for a long time. And at least one of them, fluoride, has proven beneficial in small doses.

“Fluoride is very much a two-edged sword,” Landrigan said. “There’s no question that, at low doses, it’s beneficial.” Fluoride has been shown to prevent dental cavities and aid skeletal growth. At higher levels, though, it causes tooth and bone lesions. The epidemiologic studies cited by Grandjean and Landrigan, which came from China, imply that high fluoride exposure has negative effects on brain growth.

He’s more concerned about flame-retardants—a group of compounds known as polybrominated diphenyl ethers (PBDEs). These chemicals came into vogue after their predecessors, called PCBs (polychlorinated biphenyl ethers), were banned in 1979. By the time it became clear that PCBs caused cancer—and a variety of other adverse health effects on the immune, reproductive, nervous, and endocrine systems—they’d been put into hundreds of industrial and commercial uses like plastics and rubber products. So manufacturers switched to PBDEs and advertised PCB-free products, assuming—or, at least, implying—that PBDEs wouldn’t cause problems of their own.

“California, at the urging of the chemical industry several years ago, put the highest

standard in the world on the levels of PBDEs that needed to be included in them,” Landrigan explained. “The result is that people in California have the highest levels of brominated flame retardants in their bodies.”

The state finally banned PDBEs in 2006, after studies from Columbia showed high quantities of the compound in women’s breast milk and linked it to IQ losses and shortening of attention span. Between 2008 and 2012, PDBE levels in the blood of California residents decreased by two-thirds.

Landrigan and Grandjean argue that stronger chemical safety legislation could have made all of this back-peddling damage control unnecessary. They don’t expect every chemical to go through long-term, randomized control studies prior to its release. Rather, they want to see industrial chemicals screened through a simple cell-based test. If that test were to come out positive—if the cells in the petri dish showed any kind of toxic reaction—then the chemical would be tested further.

A next step from there might be an animal testing model. The drawbacks there, Grandjean told me, are that “those programs are expensive, they take time, you have to kill hundreds and thousands of mice and rats.” However, he adds, “if a company has developed a very useful substance, and it turns out to be toxic to nerve cells in petri dishes, then maybe animal testing is the next step.”

“I don’t think that that should necessarily be a requirement,” Grandjean said. “But I can see if a company has developed a very useful substance, and it turns out to be toxic to nerve cells in petri dishes, then maybe that is the next step.”

Landrigan and Grandjean both mentioned something they called Tox21, the Toxicology in the Twenty-First Century program program, which is laying groundwork for a new kind of accelerated, large-scale testing. “TSCA reform really falls under EPA’s jurisdiction,” Landrigan said. “At the NIH and National Institute of Environmental Health Sciences, though, that’s where the latest research on this is.”

“Are the exposure levels in China comparable to what we have in our drinking water and toothpaste?” I asked.

“No, they’re probably higher,” Landrigan said. “In some places in China, there are naturally high levels of fluoride in the groundwater, which picks it up because it’s water-soluble.”

“So your advice isn’t to take it out of our toothpaste?”

“Not at all,” Landrigan said. “I think it’s very good to have in toothpaste.”



POLYCHLORINATED BIPHENYLS (PCBs)

Keeps houses from catching on fire. Used particularly in insulation, carbon copy paper and engine coolant.

Jackie Lay

When I heard that this Tox21 program is teaching a very large yellow robot to do large-scale rapid chemical testing, I had to learn more. Dr. Linda Birnbaum is the director of the National Institute of Environmental Health Sciences and the National Toxicology Program in North Carolina’s Research

Triangle. Birnbaum oversees federal funding for research to discover how the environment influences health and disease, including Tox21.

“If you want to do the full battery of current tests that we have on a chemical, you’re looking at least five years and about \$5 million,” Birnbaum told me. “We’re not going to be able to do that on large numbers of chemicals.” The robot is being trained to scan thousands of chemicals at a time and recognize threats inexpensively and quickly—before people get sick. It’s also using alternative testing models—looking at not just isolated cells, but also simple organisms like the roundworm *C. elegans* or zebrafish—to answer certain basic questions.

Unlike food and drugs, chemicals enter commerce largely untested.

Tox21 is an effort to hone technology that can effectively do rapid screening—not of one or 10 or 20 chemicals, but of thousands at a time, recognizing threats without spending \$5 million per chemical, and doing so quickly, before they make people sick or impaired. It’s also using alternative testing models—not just in isolated cells, but in simple organisms like the roundworm *C. elegans* or zebrafish—to answer certain basic questions.

The program is also looking at how a single chemical might affect a wide range of people. “We’re looking at 1,000 different human genomes from nine different ethnic groups on five continents,” Birnbaum told me.

Like Landrigan, Birnbaum raised the specter of the tens of thousands of chemicals grandfathered in 1976 that underwent no testing, as well as the commonly cited data that less than 20 percent of the 80,000 chemicals in commerce have had any testing at all. She spoke wistfully of the European Union’s chemical testing protocol, a model Grandjean had told me was “very reasonable.” It’s called REACH (Registration, Evaluation, Authorization, and Restriction of Chemicals), and it involves a tiered approach to regulation: If a compound is produced in small amounts, only some cursory information is required. If greater amounts are produced or imported, the EU requires more in-depth testing, such as animal experiments and two-generation studies.

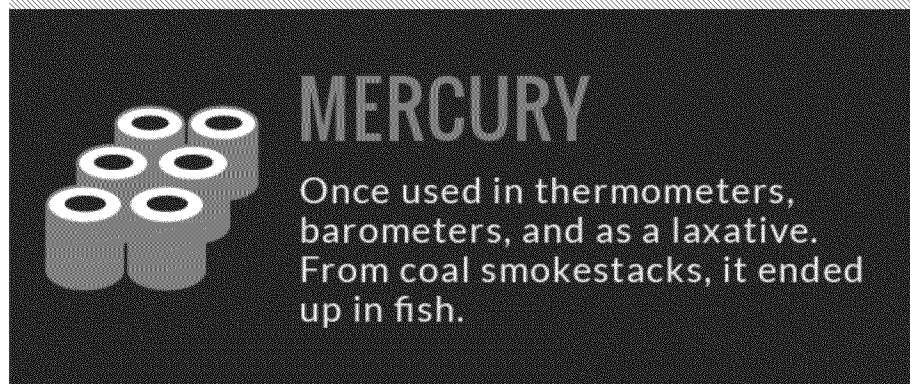
“We’ve learned a heck of a lot in the last 30 to 40 years about the safety of chemicals and what can cause problems,” Birnbaum said, “and it would be really nice if our regulations required us to use some of the newer science to answer the questions of safety.”

Don’t Panic?

“When you use the word *pandemic*, that’s a scare word,” said Laura Plunkett. “And that’s my problem. There’s a more responsible way to express it. I understand that they want to bring it to attention, but when you bring it to attention, you can still do

it in what I would say is a scientifically defensible manner.”

Plunkett has a Ph.D. in pharmacology and toxicology. Reviewing articles written in the wake of the publicity around *The Lancet Neurology* paper, I was struck by the definitive title of her blog post on a site called Science 20: “There Is No Pandemic of Chemicals Causing Brain Disorders in Children.” Plunkett has been a diplomat for the American Board of Toxicology since 1984. She taught for a while and did research at NIH, but she is now an independent consultant running her own company, Integrative Biostrategies.



Jackie Lay

One of her clients is the American Chemistry Council. She also has clients in the food, pesticide, and chemical business—“industry ties,” as they say. With that in mind, I sought her out as an established scientist who has worked on the side of the chemical-producing companies. Her blog post about the *Lancet* article was the only response I found telling people not to panic.

“What [Landrigan and Grandjean] are doing with the data is missing the key component, which is the dose,” Plunkett explained. “Many of the chemicals they talk about are well established to be neurodevelopmental toxicants in children—but it’s all about how much they’re exposed to. Just like anything else. If you don’t give people enough, or if you don’t take enough in your water or food or the air you breathe, you’re not going to have an effect.”

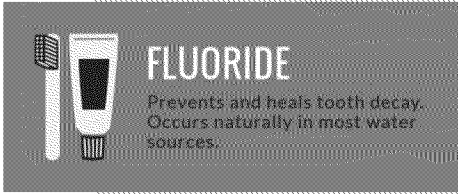
Plunkett insists that, unlike lead, some of the chemicals on the *Lancet Neurology* list are only developmental toxicants at very high levels—the sort, she says, “that nobody would be exposed to on a daily basis.”

Plunkett says she has no problem with a call to ensure that chemical testing is as thorough as possible. “But then to say, and by the way, if you look at the data, ‘We’ve been poisoning people for the last 10 years?’ That’s a whole other step that isn’t supported by the data they point to.”

I asked her how concerned American parents should be about certain individual chemicals on Grandjean and Landrigan’s list. “I mean, we knew lead was a problem 30 years ago,” she said, “and that’s why we removed it from gasoline, and that’s why we don’t let it in solder and cans, and we’ve taken lead-based paint off the market.”

“If you really look at the data on fluoride,” she continued, “trying to link an IQ deficit in a population with that chemical is almost impossible to do. Even though

statistically, randomly they may have found a relationship, that doesn't prove anything—it identifies a hazard but doesn't prove there's a cause and effect between the two things."



Jackie Lay

What about the chemical that most concerned Landrigan, the pesticide chlorpyrifos?

"No, because the organophosphate pesticides are one of the most highly regulated groups of chemicals that are out there. The EPA regulates those such that if they're used in

agriculture, people are exposed to very, very low levels."

Pesticides are indeed more regulated than other industrial chemicals. Before manufacturers can sell pesticides in the U.S., the EPA must ensure that they meet federal standards to protect human health and the environment. Only then will the EPA grant a "registration" or license that permits a pesticide's distribution, sale, and use. The EPA also sets maximum levels for the residue that remains in or on foods once they're sold.

An EPA spokesperson told me that a company introducing a new pesticide must "demonstrate more than 100 different scientific studies and tests from applicants." The EPA also said that since 1996's Food Quality Protection Act, it has added "an additional safety factor to account for developmental risks and incomplete data when considering a pesticide's effect on infants and children, and any special sensitivity and exposure to pesticide chemicals that infants and children may have." Landrigan and Grandjean don't believe that's always sufficient; the dose may make the poison, but not everyone believes the EPA's limits are right for everyone.

When I asked Plunkett whether new industrial chemicals were being screened rigorously enough, even she cited the need to strengthen the Toxic Substances Control Act of 1976. "I'm a very strong proponent of fixing the holes we have," she said, "and we do have some holes under the old system, under TSCA, and those are what the new improvements are going to take care of. They're going to allow us to look at the chemicals out there we don't have a lot of data on—and really those are the ones I'm more concerned about."

The High Price of Lost IQ

Everyone I spoke to for this story agreed that TSCA needs to be fixed. But every attempt has met with bitter opposition. All parties want it to happen; they just want it to happen on their own terms. Unless it does, they don't want it to happen at all.

Last May, a bipartisan group of 22 senators, led by Frank Lautenberg and David Vitter, introducing the Chemical Safety Improvement Act of 2013. Lautenberg, then 89 years old, was the last surviving World War II veteran in the Senate and a longtime champion of environmental safety. (Among other things, he wrote the bill that banned smoking on commercial airlines.) A month after he introduced his TSCA reform bill, Lautenberg died of pneumonia.

After Lautenberg's death, Senator Barbara Boxer told reporters the bill "would not

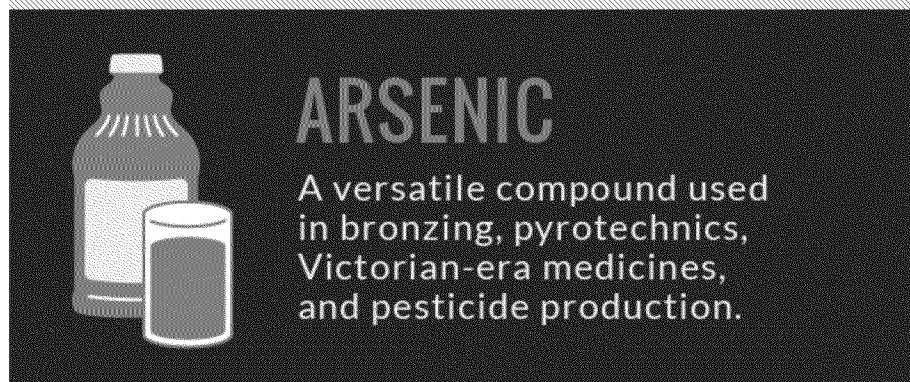
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The Toxic Chemical Panic of the 1970s

"All of the crises have many things in common. They usually involve chemicals found to be dangerous only after dissemination to the public at million- and even billion-pound levels. The Toxic Substances Control Act, signed last fall by President Ford, may change that situation."

[Read the full story](#) by John F. Henahan in the March 1977 *Atlantic*

have a chance” of passing without major changes. “I will be honest with you,” said Boxer, who chairs the Committee on Environment and Public Works, “this is the most opposition I’ve ever seen to any bill introduced in this committee.” Some of the resistance came from environmental and health advocates who felt the bill would actually make it harder for states to regulate the chemicals that were grandfathered in by TSCA. Their fears intensified in January, after 10,000 gallons of a coal-processing substance poured into West Virginia’s Elk River, contaminating a nearby water treatment plant. (The *Wall Street Journal* reported, “Little is known about the chemical’s long-term health effects on people, although it isn’t believed to be highly toxic.”)



Jackie Lay

In February, with Lautenberg’s bill stalled in the Senate committee, Republican Representative John Shimkus seized the opportunity to introduce another reform option called the Chemicals in Commerce Act. The chemical industry applauded Shimkus’ bill—it won support from the American Chemistry Council, American Cleaning Institute, and the Society of Chemical Manufacturers and Affiliates. Earlier this month at the GlobalChem conference in Baltimore, Dow Chemical’s Director of Products Sustainability and Compliance Connie Deford said that TSCA reform was in the interests of the chemical sector, acknowledging that consumer confidence in the industry is at an all-time low.

Yet the Chemicals in Commerce Act has provoked strong criticism from groups like the Center for Environmental Health and the Natural Resources Defense Council. A senior scientist with the Environmental Defense Fund called the bill “even more onerous and paralyzing” than the present law, and Representative Henry Waxman, ranking member of the House Energy and Commerce Committee, said the bill “would weaken current law and endanger public health.”

I asked the EPA to comment on Landrigan and Grandjean’s claim that we are in the midst of a “silent pandemic” and inquired what, if anything, is being done about it. The agency responded by sending me a statement: “EPA has taken action on a number of the chemicals highlighted in this report which have and are resulting in reduced exposures, better understanding, and more informed decisions.” The agency included a list of the actions it has already taken to reduce exposure to the chemicals identified in the report. (See sidebar.) And it emphasized a 2012 “Work Plan,” which includes plans to assess more than 80 industrial chemicals in the coming years.

The EPA Responds

The agency says it has taken the following actions to reduce exposure to the chemicals mentioned in Grandjean and Landrigan’s report:

Chlorpyrifos: Banned all uses in and around homes

Polybrominated diphenyl ethers: Reviewing all new uses, following a voluntary phase out by U.S. manufacturers

Lead: Numerous federal regulations over the past few decades, leading to dramatically reduced

When I emailed the statement to Landrigan, he replied, “Many of the items that they list here are things that I helped to put in place.” (In 1997, he spent a sabbatical year setting up EPA’s Office of Children’s Health Protection.) He agreed that the EPA is doing a lot to protect children from environmental threats. “But the problem is that the good people within EPA are absolutely hamstrung by the lack of strong legislation,” he wrote. “They can set up research centers to study chemicals and outreach and education programs, but without strong and enforceable chemical safety legislation, they cannot require industry to test new chemicals before they come to market, and they cannot do recalls of bad chemicals that are already on the market.”

Meanwhile, researchers like David Bellinger, who calculated IQ losses, are highlighting the financial cost to society of widespread cognitive decline. Economist Elise Gould has calculated that a loss of one IQ point corresponds to a loss of \$17,815 in lifetime earnings. Based on that figure, she estimates that for the population that was six years old or younger in 2006, lead exposure will result in a total income loss of between \$165 and \$233 billion. The combined current levels of pesticides, mercury, and lead cause IQ losses amounting to around \$120 billion annually—or about three percent of the annual budget of the U.S. government.

Low-income families are hit the hardest. No parent can avoid these toxins—they’re in our couches and in our air. They can’t be sweated out through hot yoga classes or cleansed with a juice fast. But to whatever extent these things *can* be avoided without better regulations, it costs money. Low-income parents might not have access to organic produce or be able to guarantee their children a low-lead household. When it comes to brain development, this puts low-income kids at even greater disadvantages—in their education, in their earnings, in their lifelong health and well-being.

Grandjean compares the problem to climate change. “We don’t have the luxury to sit back and wait until science figures out what’s really going on, what the mechanisms are, what the doses are, and that sort of thing. We’ve seen with lead and mercury and other poisons that it takes decades. And during that time we are essentially exposing the next generation to exactly the kind of chemicals that we want to protect them from.”

childhood blood lead levels

Methylmercury: Significant efforts to reduce exposure, including 2011 standards that reduce pollution from coal and oil-fired power plants

Polychlorinated biphenyls: TSCA banned the manufacture and import of PCBs, and EPA is reassessing the largest remaining uses

Arsenic: Banned some types of arsenic, restricted others

Fluoride: Established safe drinking water standards and currently considering other revisions

Toluene: Included in the 2012 Work Plan, with assessment to begin by 2017

Manganese: Included in the 2012 Work Plan, with assessment to begin by 2017

Tetrachloroethylene: Included in the 2012 Work Plan, with assessment to begin by 2017

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James Hamblin, MD, is a senior editor at *The Atlantic*.
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Join the discussion...

 Adrian Bachnivsky · a day ago

In other words don't drink, eat, breathe or do anything. Just kill yourself now because if you keep living, you're going to die!

55 ☐ ☐ · Reply · Share ›

 Newman · a day ago


Ya, articles like this prey on creating fear when you do anything. Not saying this info isn't good to know.

But it uses conjecture and "what ifs" to scare people. And tying all this danger to actual I.Q. points seems like a ridiculous claim.

On the side bar there is an article saying carbs (gluten) is the single greatest cause of all neurological disorders. Again, seems ridiculous. People who state these grand theories tying everything to one cause, it seems to me, use this to get attention and sell books.


I will confidently ignore most of this trash and enjoy a healthy life.

17 ☐ ☐ · Reply · Share ›

 jorgenharris >Newman · a day ago

I agree. The methodology they described sounds tailor made to create a bunch of false positives: you test for the presence of a large number of chemicals (they found 12 with frightening results--how many did they start out with?), and then look at the correlation between the presence of each chemical and a large number of cognitive and developmental outcomes across several time periods. Even if we set aside the possibility of real non-causal correlations, which are likely since poorer people live in older buildings, eat less organic produce, and live closer to traffic, the problem of multiple comparisons is huge.

9 ☐ ☐ · Reply · Share ›

 Jill >jorgenharris · a day ago

I want to make sure I understand your post. When you say - how many did they start off with, do you mean chemicals or people?

Also, as I read it (I plan on getting the magazine and studying it more closely), this test was done across socio-economic classes. A pretty large sized data set was used (always key), with the hypothesis *including* (like you said) that poorer people typically live in more polluted areas and eat less healthy food not *concluding,* so it makes sense that the indicators used would *factor that in*, rather than make it a conclusion. I saw that as a side issue anyway.

I thought the study looked well done and very straight forward, not designed to create fear. I used to do research for a living so I too am picky and skeptical about these sorts of conclusions, but this study did give me pause as it looks pretty tight.

I will gladly retract my cautious support if it proves to be specious. As suspicious as I am of the honesty of chemical companies (with good reason), it does no one any good to use faulty data to make a point either way.

24   · Reply · Share ›



Jill >Newman · a day ago

Can you speak explicitly to the data presented and what you find faulty in it?

12   · Reply · Share ›



Newman >Jill · a day ago

Nope. Don't really feel a need to. But it's impossible to take a person, raise them on these chemicals, test their I.Q., then raise THE SAME PERSON again on no chemicals, and test their I.Q. Then compare I.Q.s.

And then also control for the billion other variables that a person is subject to

That's the only way you'll convince me that I or anyone else has lost I.Q. points directly because of these chemicals.

But that's all beside the point. One has to decide if they will live their life in constant fear, as this article certainly hints at doing (it's in the subhead), or live the best life they can and actually enjoy it.

I'll take the enjoyment, to the disappointment of these scientists, I'm sure.

10   · Reply · Share ›



Jill >Newman · 20 hours ago

Your priorities speak for themselves. Why should you engage with the facts, after all - you don't feel "the need to." Looks like it's much easier to pontificate and philosophize. I would imagine it is.

It's not living one's life in fear to be knowledgable, nor does it require a lack of enjoyment. It's quite the opposite in fact. You want to stuff lead back in your gasoline because you - uh" Have no fear? Be my guest. That's just idiotic, but by golly you'll show those pointy headed scientists a thing or two. Lol.

But do please leave concrete research and public policy decisions that comes from it to those who aren't afraid to objectively engage with facts and deal accordingly. Don't bother your mind with such overtaxing thoughts.



29   · Reply · Share ›



Kizmiaz >Jill · 19 hours ago

I'd love to have lead back in gasoline, It is better for your car, esp. the classics, than ethanol. And concerning this article, it is not written using knowledge, it is written using

someone's theories. Well I'm off to drive around in my mid 60s muscle car.

1   · Reply · Share ›



Newman >Jill · 19 hours ago

Hey Jill, chill. I get the seriousness of keeping our environment and food healthy. I have a kid too.

I still think articles such as these need a heavy dose of perspective.

Why on earth did this article need to say in the subhead that children and the poor might not have peace of mind in this world because of chemicals? It's in the subhead. I didn't write it.

If my daughter read this on her own, I would probably have to sit her down and give her some perspective on the situation. Well, I think the author, and these scientists, have a duty to do that.

You clearly care a lot about these issue and it seems like you have a good amount of knowledge on them.

I'll finish by saying people like me who question articles like this still care about the world as much as you do.

8   · Reply · Share ›



gfish3000 >Jill · 19 hours ago

Actually the facts in this case are being played with quickly and loosely. Can chemical be dangerous? Absolutely. Any chemical has a level at which it becomes toxic. Too much water can kill you by diluting all of the electrolytes in your body and shutting down your kidneys.

Here's the key point to keep in mind. When someone holds up a study saying that Chemical X is dangerous for you, very often that study has disclaimers about the dose found to be toxic. Much trumpeted studies on the carcinogenic properties of aspartame turned out to be based on the equivalent of drinking 2,000 cans of pop per day. Try that feat and you'll be dead long before can number 50.

Should we now base what we will allow to go into pop based on the idea of someone drinking a few thousand cans a day? These researchers are saying yes.


4   · Reply · Share ›



LaurelhurstLiberal >gfish3000 · 13 hours ago

Did you even read the article? It addresses those dosage issues very clearly.

I think the bigger question is, why are soda companies putting neurotoxic metals in our drinks?


3   · Reply · Share ›



gfish3000 >LaurelhurstLiberal · 11 hours ago

Yes it addresses those issues by bringing them up and swinging right back into panic mode. Okay, a little fluoride is beneficial. But too much will turn your kids into meat with eyes! Think of the children, someone think of the children! The EPA is powerless against Blg Chem!



No, really, the big question is that if soda companies putting neurotoxic metals in our drinks, why are we still able to function and overall IQs of developed nations keep going up?

4   · Reply · Share ›



Joe KomaGawa >LaurelhurstLiberal · 7 hours ago

I don't doubt the sincerity of a couple of the posters I have read so far. I do doubt that they have the mathematical reasoning skills to remember and digest what they have read in the grammar of the sentences after such a long article. this essay writer has had to sacrifice detailed explanation of relationships in order write an accessible essay for this audience. If he didn't do that such readers wouldn't even finish reading this essay, much less understand it. I'm not sure which way to go is better. I say all this because I worked in aerospace as a technical writer.

2   · Reply · Share ›



Marilyn G >Jill · 17 hours ago

Jill, people like Newman are most likely paid by chemical companies, big Ag or big tobacco to stir doubt. They are in every comment section of every article dealing with environmental concerns. They are not on this board to have an intelligent discussion. Mainly, they are here to distract from the scientific research and draw people away from the information that may help us make informed choices. More and more people are calling them out when they see them.



I have felt so much better since I became a vegetarian six years ago, and started eating organically. We grow a lot of our own organic fruits and vegetables in above ground containers in a very small backyard. Also, since I started using organic/vegan personal products, I look younger than I did when I was spending a fortune on toxic anti-aging formulas. I use the EWG cosmetic data base, and their cleaning product data base. I've found products that work better than the toxic junk, and I can get everything online from mainstream sites.

11   · Reply · Share ›



Moderate Libertarian >Marilyn G · 31 minutes ago



Marilyn, that's usually the tact used by folks who don't have much of an argument. Call everyone who disagrees with you an industry shill. That would be like me saying that your an environmental shill. In my opinion, Jill was doing just fine in this dialogue and making well-thought, reasonable points, even if I did disagree with some of them.

  · Reply · Share ›



Moderate Libertarian >Jill · 40 minutes ago

Comparing a well-known neurotoxin like lead or methyl mercury to the myriad other chemicals mentioned in the article is misleading at best. There have been plenty of toxicological studies conducted for lead and methyl mercury that have been repeated with unambiguous results. You can't say the same thing for the studies conducted by Landrigan, Bellinger and others. I've read plenty of Landrigan's "studies" and he does not follow established toxicological protocols, nor have any of his studies ever been repeated. The statistical analyses mentioned in the article are not designed to establish cause and effect, so trying to quantify lost IQ points is a fallacy. Lastly, when I was in school studying chemistry we weren't allowed to use publications like the Lancet or Environmental Health Perspectives as references because of their shoddy reputation.

  · Reply · Share ›



Marilyn G >Newman · 18 hours ago

Yes, Mr. Monsanto, or are you Mr. Dupont, or big tobacco, or big ag...??? Or are you paid to troll these articles, Newman.

2   · Reply · Share ›



rsbsail >Marilyn G · 7 hours ago

Are you Ms NRDC? Or Ms Greenpeace? See, this is an easy game to play.



1   · Reply · Share ›



Marilyn G >rsbsail · 6 hours ago

SMH at people who don't want other people to make informed choices. I don't understand your agenda, unless you do work for the businesses that are profiting from toxic products. Why do people assume that clean products and food are not as good as the products that contain toxic chemicals? You've been so brainwashed by decades of ads telling you that you need these products. One of the chemicals in this article, toluene, was in nail polish until consumers were informed about its toxic properties and through pressure it was removed in the last couple of years.



So go ahead & eat your bread that contains the same chemical that's in yoga mats & flip flops, enjoy your hormone & antibiotic laced dairy products, oh and eat up that red meat that contains a muscle enhancing agent that is causing steers to lose their hoofs-wonder what it will do to your feet-lol? That is if you can come up for air, since you have your heads buried in the sand.

2   · Reply · Share ›



Moderate Libertarian >Marilyn G · 22 minutes ago

You're really a mean one, Marilyn, aren't you? Can't you have a civil discussion without name-calling or hyperbole? You haven't made one valid point related to the article. My guess is you don't have the capacity to learn on your own, so you depend on zealots for your information and typically resort to these cheap tactics to try make an argument.

  · Reply · Share ›



MESTHK · a day ago



I never normally comment on an article but the scare-mongering in this is ridiculous. What did the author and the magazine hope to achieve by such an article? It doesn't serve any purpose and waters down numerous quotes from sources telling people actually not to panic. Very disappointed with this magazine for publishing such a piece.

26   · Reply · Share ›



Dan_Rather_Not >MESTHK · 16 hours ago

They hoped to achieve hits. Nothing here is new or important.

3   · Reply · Share ›



nyc2387 · a day ago
#FUD

2 · Reply · Share ›



Newman · a day ago

Ya, this article is kind of ridiculous. Especially the subhead of costing people peace of mind.

The doctors that profess this kind of scare stuff live in their labs, not in the real world. Tying these chemicals to actual I.Q. points seems ridiculous.

I will continue on enjoying my normal, healthy life brushing my teeth with flouride and eating food from the grocery store.

10 · Reply · Share ›



Secretoski · a day ago

Excellent article! What is even scarier is that we have 85,000 to 100,000 introduced chemicals in our environment with only 12-15 having any long term testing. The amount of possible variables are beyond the testing abilities of any institution.

On another note. If you get nervous about new information, why read it in the first place?

39 · Reply · Share ›



Moderate Libertarian >Secretoski · 13 minutes ago

Sorry, but according to the US EPA there has never been 85,000 chemicals in commerce at any given time. If you don't count plastics and R&D chemicals that are only found in laboratory settings, which EPA has studied intensively and found to present no risk, there are fewer than 10,000 chemicals in commerce during any given year. Over 2,300 chemicals have been tested under the High Production Volume Chemical Program. Additionally, EPA has reviewed over 20,000 chemicals under its new chemicals program.

· Reply · Share ›



ewong79 · a day ago

Wait, I'm confused — I thought that IQ tests were non-scientific tools that were designed to perpetuate and justify racial/class-based divisions and told us nothing about intelligence or cognition! After all, when The Bell Curve came out in 1994, the media (and conventional wisdom in the chattering classes) held that IQ tests measured nothing but how well one did on IQ tests, and were designed by racists to prove White superiority (never mind that Asians and Jewish people have long scored higher than White people). The same happened more recently with Jason Richwine. Didn't Stephen Jay Gould bury all of this IQ nonsense in The Mismeasure of Man (Gould's scientific fraud on the skull-volume data notwithstanding?) Isn't IQ pseudoscience?

I can only conclude that these doctors, epidemiologists and neuroscientists — insofar as they invoke IQ and other culturally-determined diagnoses like “behavioral problems” — are spouting discredited racist nonsense. It must therefore be racist to be concerned about the neurotoxic effects of these chemicals, and to keep one's children (or oneself, when pregnant) away from them.

24 · Reply · Share ›



EnderTZero >ewong79 · a day ago

IQ is a statistical predictor of individual success, which we understand to be associated with that nebulous concept, 'intelligence.' Since intelligence itself cannot be directly studied, we must approximate by rigorous

measurement and comparison against a mean; thus, the IQ test.

With the issue of race specifically, in short we're still working on the exact mechanism that produces the difference among groups. Some of the epigenetic factors in the article above (exposure to chemicals, prenatal stressors and poor nutrition) are likely partially responsible, and cultural factors such as stereotype threat are another culprit.


Considering that what an IQ test actually predicts is later success, rather than some bedrock measure of intelligence, no, all those things you're saying are wrong and silly.

20   · Reply · Share ›



Jill >EnderTZero · a day ago

But how can sociological factors possibly be ignored in this measure? It's blind to even try.

1   · Reply · Share ›



EnderTZero >Jill · a day ago

You ignore them by controlling for them - it's a statistical measure, so you just need a big enough group for each appreciable social factor. Your IQ is relative to the rest of the population, it only tells you how well you might do compared to other people, not some mystical measure of your actual intelligence.

8   · Reply · Share ›



Jill >EnderTZero · 19 hours ago

To me, you cannot objectively control for sociological factors. How would you go about doing so? What indicators would you use? Example?

  · Reply · Share ›



EnderTZero >Jill · 18 hours ago

Depends on the factor? Your cutoff for something on a continuum (like poverty) is always going to be arbitrary, but generally you look for two groups of people who are as similar as possible, save one factor. It's messy because it's social science, but then that's how it goes.

2   · Reply · Share ›



Christy2012 >Jill · a day ago

I don't think anyone is suggesting that we ought to completely ignore 'sociological factors', but that the preponderance of the evidence suggests that its role is relatively small, especially later on in adulthood (children tend to converge more on their parents' IQ later in life).

3   · Reply · Share ›





Jill >Christy2012 · 19 hours ago

Right - it's just my preference. I find IQ to be a highly dubious and often empty measure to use in research. It's kind of a lazy shorthand sometimes that becomes a distraction. It depends on what the study is hoping to accomplish. Impact on society seems much more useful than lost IQ points.

Rates of graduation, rates of addiction, rates of employment, relational measures, arrest records, mental health (out of wedlock birth, rates of marriage - also loaded but at least concrete) are more practically and helpful, even when discussing neurotoxicity. Why use such a loaded way to measure?

Just do the work and break it down in a way that is clearly objective and can be understood without the emotionality and controversy attached to IQ.

2   · Reply · Share ›



Christy2012 >Jill · 19 hours ago

You may find IQ to be highly dubious, but it has good predictive validity (far more than race, class, income, etc). Academic and employment outcomes, several forms of which you specifically mentioned, are particularly well linked to IQ. We may not be able to change IQ through policy (I very much doubt we can, baring some extreme cases of lead poisoning and the like), but denying these differences will tend to lead us down the wrong policy paths.



<http://infoproc.blogspot.com/2...>

1   · Reply · Share ›



Guest >ewong79 · a day ago

Ha - good point! This is a fair critique of the dubious measure of "IQ" for conclusions in studies.

3   · Reply · Share ›



Marilyn G >ewong79 · 21 hours ago

FYI@ewong79, your statement that Jewish people have long scored higher than white people belays your understanding of race and removes any credibility you may have had. The Jewish religion is not a race, even though the Nazis & John Birch Society aka the Tea Party would like you to believe this. There are three races- Caucasian (white), Negroid (black), and Mongaloid (Asian), and people of mixed race. Yes, you are confused!

1   · Reply · Share ›



Clytannestra Dunge >Marilyn G · 20 hours ago

so when i tell my jewish neighbor he has a big nose you'll be at my side defending how i am totally not-racist?

4   · Reply · Share ›



Marilyn G >Clytannestra Dunge · 20 hours ago



Your remark was so stupid & irrelevant, that even though I don't know you, I am embarrassed for you. Your lack of IQ points definitely suggests toxic exposure! Google it if you are ignorant about race.

6   · Reply · Share ›



Jacob Blues >Clytannestra Dunge · 15 hours ago

Actually, you will just be considered rude because you didn't notice the well done nose job.

3   · Reply · Share ›



Kizmiaz >Marilyn G · 19 hours ago



Most people of the Jewish faith that I know are much more intelligent than your garden variety American.

2   · Reply · Share ›



Marilyn G >Kizmiaz · 18 hours ago

Kismiaz, what you are talking about is an ethnic and cultural opinion, not of race. People of the Jewish faith can be of any race, which is the same of any religion. However, this is a distraction from the original purpose of this article, which is the pollution of our planet, a very real and present danger.

2   · Reply · Share ›



Olive >ewong79 · 21 hours ago

Maybe you should consider the case of individuals with high-functioning autism, who usually have average or above-average intelligence as measured by IQ tests.

3   · Reply · Share ›



Jill >Olive · 19 hours ago



Right, excellent point.

1   · Reply · Share ›



gfish3000 >ewong79 · 19 hours ago

IQ is not pseudoscientific per se. It's a measure of how efficiently and correctly you can solve problems requiring pattern matching, math, and logic. Basically a high IQ means you have the potential to be a good problem solver and that's about it.

3   · Reply · Share ›



Anne Thrope · a day ago

Thank you James Hamblin! Absolutely awesome piece of writing/research, and kudos to the Atlantic for continuing to publish in this arena. Sent it to my Senator. I suspect the naysayers of what you have published here have likely not experienced, first hand, any of the fallout from the chemical industry, or they simply haven't put two and two together yet and come up with four, but then, the failure of people to realize what is happening to them more or less serves as ironic evidence for what Ballinger asserts has actually been percolating for a long, long time.

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